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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/994,397	11/26/2001	Paul R. Besser	039153-0472 (G1177)	7858

7590

07/07/2003

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EXAMINER

GUERRERO, MARIA F

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 07/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/994,397

Applicant(s)

BESSER ET AL.

Examiner

Maria Guerrero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to the Amendment filed June 2, 2003.

Claims 1-20 are pending.

The Applicant should update related applications information.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The original disclosure does not provide support for the limitation "energy of 5.0 KeV or **less**". The original disclosure recites implanting at an energy, such as, 0.5 to 5KeV (pages 7-8).

In amended cases, subject matter not disclosed in the original application is sometimes added and a claim directed thereto. Such a claim is rejected on the ground that it recites elements without support in the original disclosure under 35 U.S.C. 112, first paragraph, "Waldemar Link, GmbH & Co. v. Osteonics Corp. 32 F.3d 556, 559, 31 USPQ2d 1855, 1857 (Fed. Cir. 1994); In re Rasmussen, 650 F.2d 1212, 211 USPQ

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323 (CCPA 1981). See MPEP § 2163.06 - § 2163.07(b) for a discussion of the relationship of new matter to 35 U.S.C. 112, first paragraph. New matter includes not only the addition of wholly unsupported subject matter, but may also include adding specific percentages or compounds after a broader original disclosure, or even the omission of a step from a method. See MPEP § 608.04 to § 608.04(c). See *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976) and MPEP § 2163.05.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andricacos et al. (U.S. 6,268,291) in view of Farrar (U.S. 6,426,289).

Andricacos et al. teaches forming a barrier material layer along lateral sidewalls and a bottom of a via, the via electrically connecting a first conductive layer and a second conductive layer (Fig. 2, 4B, 5B, 6, col. 8, lines 48-60, col. 10, lines 13-20, 35-40). Andricacos et al. discloses implanting a metal into the barrier material layer, the implanted metal making the barrier material layer more resistant to copper diffusion (col. 5, lines 60-65, col. 6, lines 45-67, col. 8, lines 15-20, col. 10, lines 33-40, 48-55, 60-65). Andricacos et al. shows the barrier layer being tantalum and implanting tin (Sn) (heavy metal) (col. 10, lines 52-55, 62-65).

In addition, Andricacos et al. shows the implanted metal forms an intermetallic with the second conductive layer (copper) (col. 13, lines 5-10). Andricacos et al. teaches providing a copper layer over an integrated circuit substrate, providing a barrier material layer at a bottom and sides of a via positioned over the copper layer, implanting a low dose metal species into the barrier material layer at an angle of zero degrees (Fig. 2, 4b, 6, col. 8, lines 48-65).

Furthermore, Andricacos et al. discloses depositing a copper layer, depositing an etch stop layer over the copper layer, and depositing an insulating layer over the etch stop layer (Fig. 2, col. 8, lines 30-55). Andricacos et al. teaches forming an aperture in the insulating layer and the etch stop layer, providing a barrier material at a bottom and sides of the aperture, implanting a metal species into the barrier material layer, the implanted metal making the barrier material layer more resistant to copper diffusion (Fig. 2, 4B, 6, col. 10, lines 15-20, 35-40, and 48-50). Andricacos et al. inherently shows that the implanting make the barrier material layer amorphous. Andricacos et al. shows filling the aperture with a via material to form a via and providing a conductive layer over the via such that the via electrically connects the conductive layer to the copper layer (Fig. 2, 6, col. 8, lines 35-60).

Andricacos et al. does not specifically show the specific thickness, energy, and dose as claimed. However, Andricacos et al. teaches implanting at various energies ranging from a few KeV to several hundred KeV (col. 11, lines 7-10). In addition, Farrar shows forming a barrier layer having a thickness of 5 to 40 Angstroms, implanting with

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an energy level between 0.125 KeV to 2.0 KeV, and a dose (concentration) of about 1.25×10^{16} ions/cm² to 2.0×10^{17} ions/cm² (col. 4, lines 25-38).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Andricacos et al. reference by including the thickness, energy, and dose taught by Farrar because it is within the capabilities of a skilled in the art to replace any appropriate energy range without undue experimentation. The modification is proper because the claimed range is not critical to the invention and Andricacos et al. suggested implanting at various energies ranging from a few KeV to several hundred KeV (col. 11, lines 7-10).

Furthermore, to establish unexpected results over a claimed range, applicants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. In re Hill, 284 F.2d 955, 128 USPQ 197 (CCPA 1960). The applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990).

Response to Arguments

4. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Blish, II et al. (U.S. 5,882,738) is cited as evidenced to show that Andricacos et al. inherently shows that the implanting make the barrier material layer amorphous.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 703-305-0162.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 703-308-4905. The fax phone numbers

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for the organization where this application or proceeding is assigned are 703-308-7722

for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


Maria Guerrero
Patent Examiner
July 2, 2003